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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/743,722	DUMITRAS ET AL.
	Examiner	**Art Unit**
	David N. Werner	2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _05 May 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-8,10-24,29 and 31-33_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-8,10-24,29 and 31-33_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _24 December 2003_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action for US Patent Application 10/743,722 is responsive to communications filed 05 May 2008, in reply to the Non-Final Rejection of 04 February 2008. Currently, claims 1-8, 10-24, 29, and 31-33 are pending.

2. In the previous Office action, claims 1, 5, 10-13, 18-22, 29, and 32-33 were rejected under 35 U.S.C. 103(a) as obvious over "Temporally Adaptive Interpolation Exploiting Temporal Masking in Visual Perception" (Lee et al.) in view of US Patent Application Publication 2003/0142748 A1 (Tourapis et al.). Claims 2, 6-8, and 17 were rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and "Scene-Context Dependent Reference Frame Placement for MPEG Video Coding" (Lan et al.). Claims 3, 4, 14, and 23 were rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and US Patent Application Publication 2002/0146071 A1 (Liu et al.). Claims 15 and 24 were rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and "MPEG Video Compression Standard" (Mitchell). Claim 16 was rejected under 35 U.S.C. 103(a) as obvious over Lee et al. in view of Tourapis et al. and "Digitale Bildcodierung" (Ohm). Claim 31 was rejected under 35 U.S.C. 103(a) as obvious over Tourapis et al. in view of "Video Indexing Using MPEG Motion Compensation Vectors" (Ardizzone et al.).

Response to Arguments

3. Applicant's arguments filed 05 May 2008 have been fully considered but they are not persuasive. Applicant states that the prior art does not teach the claimed limitation in claim 10 of coding a picture as a B picture in case of consistent motion speed, with the Tourapis reference merely coding B frames (determined in another process) in a direct mode "assuming that speed is constant". It is respectfully submitted that Applicant mischaracterized the combination made between Lee et al. and Tourapis et al. While it is true that Lee et al. does not teach assigning B pictures "if the motion speeds are consistent with each other", Lee does teach assigning B pictures based on a consistency measure between pictures, with frames found to be within a single "temporal segment" with a small change in pictures encoded as B frames (p. 515: columns 1-2). Tourapis et al. was not relied on to teach "coding the respective picture as a B picture", but only that constant motion speed is a known measure of picture consistency, and suitable in the Lee et al. reference to determine the boundaries of a temporal segment rather than motion compensation error, a great difference in frames, or an accumulation of small differences over several frames. In addition, Tourapis et al. discloses a Direct prediction decision module 1208 (paragraphs 0098-0099), which determines when to code a block in a direct mode, and so determines when or how the assumption that motion speed is constant for an input sequence of video data. Therefore, the Examiner maintains all prior art rejections based on the combination of Lee et al. and Tourapis et al.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 5, 10-13, 18-22, 29, and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Temporally Adaptive Interpolation Exploiting Temporal Masking in Visual Perception” (Lee et al.), in view of US Patent Application Publication 2003/0142748 A1 (Tourapis et al.). Lee et al. teaches a method for dynamically determining a Group of Picture (GOP) structure in a video based on temporal segmentation. **Regarding claim 1**, in one embodiment of Lee et al., temporal segmentation is determined from a motion compensation error determination (pg. 519: column 1), which must inherently use motion vectors to determine a predicted image to be compared with an actual image. Lee et al. also incorporates a "typical motion compensation encoder" (pg. 514: column 2), which includes a motion estimation unit. Then, Lee et al. discloses "computing motion vectors for a plurality of pictures".

Consider the determination of temporal segmentation based on motion compensation error in Lee et al. If the error between an actual frame and a predicted frame becomes too great, then it is determined that there is little consistency between frames, but if there is a small error, then temporally adjacent frames are considered to exhibit consistency. This information is used in a detector that finds a scene segmentation point, which is a point at which small changes in a single scene have

accumulated past a certain threshold away from a reference frame. The frame immediately preceding the scene segmentation point becomes a P frame, and the frames in between the last reference frame and the scene segmentation point are encoded as B frames (pg. 515: columns 1-2). Then, Lee et al. teaches assigning pictures as B pictures based on a consistency measure. However, as discussed in the interview of November 15, determining motion compensation error *per se* is not considered the same as determining consistent motion speed.

Tourapis et al. teaches a video coder that encodes inter macroblocks using various modes. In one mode, a "Direct prediction mode", a current macroblock in a B picture may be calculated from previously-decoded motion information (paragraph 0067). Then, the motion for the current picture is just re-used from the previous picture, instead of being re-coded and re-transmitted. When motion speed is determined to be constant, the motion for the current macroblock is directly taken from the corresponding macroblock in a reference frame (paragraph 0068). This determination is known as Motion Projection. Then, in Tourapis et al., a constant motion speed is known as a measure of consistency between pictures.

Lee et al. discloses the claimed invention except for determining a picture mode from a calculation of consistent motion speed. Tourapis et al. teaches that it was known to determine motion compensation mode as a result of a motion projection calculation of constant motion. Therefore, it would have been obvious to one having ordinary skill in the art to determine a picture mode based on the validity of an assumption of constant motion, as taught by Tourapis et al., since Tourapis et al. states in paragraph 0118 that

such a modification would enable a direct mode coding of blocks in B pictures, further exploiting temporal redundancy with a current picture and reference pictures.

Regarding claim 5, the method of Lee et al. could be adjusted to insert 1-3 default P frames in a GOP to avoid encoding delay (pg. 516, column 2 – pg. 517, column 1). For a 16-frame GOP, if 1 P-frame is inserted, for example, no more than 8 B-frames could be inserted consecutively. Even if no P-frames are inserted by default in a GOP, the number of consecutive B-frames is limited by the GOP size of 15 or 16 frames, since a GOP starts with an I-frame.

Regarding claims 10-13 and 33, in Lee et al., two kinds of segmentation are determined, corresponding with the claimed "termination condition". The first type of termination is the determination of a P picture, reached when an accumulated error in pictures goes past a certain threshold. This corresponds with a failure in the motion projection of Tourapis et al., in which case it is determined that a Direct Mode coding is inappropriate. When the threshold is reached, the frame immediately preceding the segmentation point becomes a P frame, and the frames in between the last reference frame and the scene segmentation point are encoded as B frames (pg. 515: columns 1-2). Another segmentation detector determines an abrupt scene change, and encodes an I frame at the start of a new scene and a P frame at the end of the previous scene (pg. 515, column 1).

Regarding claim 18, figure 1 of Lee et al. shows a Temporally Adaptive Motion Interpolation (TAMI) encoder. This encoder includes a buffer, a conventional MPEG encoder, a motion estimation unit, a scene segmentation point (SSP) detector, and a

GOP Structure unit (pg. 514, column 2 – pg. 515, column 1). If this GOP Structure Unit performs the Motion Projection calculation of Tourapis et al., it corresponds with the claimed "colinearity detector". **Regarding claim 19**, the TAMI unit determines the positions of P and B pictures in a GOP (page 514, column 2). **Regarding claim 20**, as mentioned previously, motion projection may be determined from the colinearity of motion vectors. **Regarding claim 21**, the Abrupt Scene Change (ASC) detector determines a scene change in an encoded video. **Regarding claim 22**, as mentioned above, at a scene change, an old scene ends with a P-frame and a new scene starts with an I-frame.

Regarding claim 29, in Tourapis et al., figure 6 illustrates a direct mode P picture at time t+2, in which the motion vector (dx, dy) for the corresponding block A at time t+1 is extended for current block B. This corresponds with the claimed iterative method. **Regarding claim 32**, in Tourapis et al., direct mode blocks have directly temporally scaled motion vectors (paragraphs 0118-0119).

6. Claims 2, 6-8, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al., as applied to claims 1 and 10 above, in view of "Scene-Context Dependent Reference Frame Placement for MPEG Video Coding" (Lan et al.), cited in the Information Disclosure Statement filed 12 May 2004. **Claim 2** of the present application recites encoding the first frame with a variance in motion speed as a P-frame. However, in Lee et al., the first frame with a motion inconsistency above a

certain threshold is encoded as an I-frame, and the frame immediately previous to this point is encoded as a P-frame (pg. 515, column 2).

Lan et al. teaches a picture-type assignment algorithm in which if the difference in accumulated motion between a current frame and a reference frame is above a certain value, the current frame is encoded as a P-frame, and becomes the next reference frame (pg. 481, column 2).

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for encoding the first frame that does not follow a frame trend as a P-frame. Lan et al. teaches that it was known to encode a significantly changed frame as a P-frame. Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to encode reference frames as P-frames rather than I-frames as taught by Lan et al., since it was well-known in the art that P-frames require less bits to be encoded than I-frames.

Additionally, claims 6 and 17 recite coding some pictures as I pictures for a random-access policy. Lee et al. and Tourapis et al. do not teach this limitation. Lan et al. teaches an MPEG coding method in which frame type assignment is varied. **Regarding claims 6 and 17**, Lan et al. discloses forcing I frames into a coded video sequence every 15 frames to facilitate random access (pg. 486, column 1). **Regarding claim 7**, in Lan et al., whenever an I-frame is encoded, the previous frame is encoded as a P-frame (pg. 481, column 1). **Regarding claim 8**, in Lee et al., P frames can be encoded as P1 frames which are regular MPEG P frames, or as P2 frames, which have

the same bit allocation as MPEG B frames and are thus coarsely quantized (pg. 514, column 2).

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for forcing I-frame encoding. Lan et al. teaches that it was known to encode I-frames at regular intervals. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the coding method of Lee et al. to insert periodic I frames as taught by Lan et al., since Lan et al. states in page 486, column 1 that such a modification would enable random search and pause features at playback time.

7. Claims 3, 4, 14, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al. as applied to claims 1, 12, and 21, in view of US Patent Application Publication 2002/0146071 A1 (Liu et al). Lee et al. teaches scene change detection, but always encodes the first picture after the scene change as an I-frame and the last picture before the scene change as a P-frame.

Liu et al. teaches a scene change detection component in a video encoder. In Liu et al., a scene change is normally encoded as an I-frame. However, this is not always the most efficient coding method. **Regarding claims 3, 14, and 23,** Figure 10 shows a scene change between frame 1001 and frame 1002. Frame 1001 was originally scheduled to be encoded as an I-frame, but since a scene change immediately follows, much computational effort would be wasted in calculating high-quality images immediately after the scene change. Then, frame 1001 is instead

encoded as a P-frame, and frames 1002 and 1048 are encoded as low-quality predictive frames, since human vision is insensitive to quality changes near a scene change (paragraph [0079]), corresponding with the claimed coding of a picture before a scene change at full quality or low quality in **claim 4**. Figure 11 gives a further example. Here, a scene change occurs immediately preceding a P-frame 1102. Frame 1104, two frames before the scene change, was originally scheduled as an I-frame, but instead the I-frame is delayed until frame 1110, for which motion vectors have not yet been calculated (paragraph [0080]). Finally, figure 13 shows a scene change immediately preceding P-frame 1302, which was originally scheduled as an I-frame. However, since motion vectors 1304 and 1306 to frame 1302 have already been calculated, the I-frame is delayed until frame 1308, originally scheduled to be the next P-frame (paragraph [0082]).

Lee et al., in combination with Tourapis et al., teaches the claimed invention except for encoding P-frames immediately surrounding scene changes. Liu et al. teaches that it was known to encode a frame immediately preceding or immediately following a scene change as a P-frame. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to encode frames adjacent to scene changes as P-frames as taught by Liu et al., since Liu et al. states in paragraph [0079] that such a modification would increase encoding efficiency by not encoding irrelevant data near a scene change, at which time the human eye cannot clearly distinguish details of an image.

8. Claims 15 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., in view of Tourapis et al., as applied to claims 10 and 21 above, and in further view of “MPEG Video Compression Standard” (Mitchell), cited in the Information Disclosure Statement of 17 July 2006. Although in Lee et al., a default picture is encoded as a B-frame, Lee et al. does not explicitly state that pictures adjacent to scene changes are B-frames. However, Mitchell states that since the eye is insensitive to image content near scene changes, image quality can be sacrificed. **Regarding claims 15 and 24,** one method of reducing image quality is to start a new scene with B pictures (footnote 13).

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for encoding B-frames adjacent to a scene change. Mitchell teaches that it was known to encode B-frames immediately following a scene change. Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to force B-frames immediately following a scene change, as taught by Mitchell, since Mitchell states in page 79 that such a modification would reduce the bit rate needed to encode a scene change.

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al. as applied to claim 12 above, and in further view of “Digitale Bildcodierung” (Ohm), cited in the Information Disclosure Statement of 17 July 2006. Lee et al. teaches scene change detection based on a low correlation between two images (pg. 515, column 1), but does not disclose the exact method used. Ohm

teaches the Normalized Cross-Correlation Function (NCCF), shown as equation 5.52. **Regarding claim 16,** NCCF is used in many pattern-matching applications, such as motion estimation (pg. 1). Two images, $x_a(m_a, n_a)$, and $y_j(m_a, n_a)$, are compared over pixels (m_a, n_a) in area Λ. This corresponds with images $x_n(i, j)$ and $x_{n+1}(i, j)$ in area (M, N) in the present invention. Two pictures have the highest match when the NCCF is at a maximum (pg. 3), and correspondingly, two pictures have a low match, indicative of a scene change, when the value of NCCF is low.

Lee et al., in combination with Tourapis et al., discloses the claimed invention except for the exact method used to determine correlation of two images. Ohm teaches that it was known to determine how closely two images match each other with Normalized Cross-Correlation. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine the correlation of two images using NCCF, as taught by Ohm, since Ohm states in page 4 that such a modification would allow for a more accurate comparison of the similarity of two images rather than by difference levels alone.

10. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. in view of Tourapis et al., as applied to claim 29 above, and in further view of "Video Indexing Using MPEG Motion Compensation Vectors" (Ardizzone et al.) Conventionally, a motion vector for a block is defined as the displacement of the block between two pictures, velocity is defined as displacement over time, and speed is defined as the magnitude of velocity. However, while two-dimensional displacement is

normally given with the Euclidian distance metric, the square root of the sum of the squares of the x and y components, in claim 31, displacement is given with the Manhattan distance metric, the sum of the x and y components. Ardizzone et al. teaches a method for spatially segmenting an MPEG image with motion vectors (pg. 725, columns 1-2). In one step of Ardizzone et al., magnitudes of the motion vectors are built into a histogram to determine “dominant” regions of the image (pg. 727, column 2). If a motion vector has a large magnitude, this means that its macroblock is displaced a large distance, and so has a high speed. An experiment was performed to determine how best to retrieve related images to a given image, by matching motion vector characteristics (pg. 728, column 2 – pg. 729, column 1). **Regarding claim 31,** using a Manhattan distance metric yielded the best result (pg. 729, column 1).

Lee et al. discloses the claimed invention except for defining pixel block displacement with a Manhattan distance metric. Ardizzone et al. teaches that it was known to calculate motion vector magnitude with Manhattan distance. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine motion speed of an image based on the Manhattan distance metric, as taught by Ardizzone et al., since Ardizzone et al. states in page 729, column 1, that such a modification would produce the greatest accuracy in characterizing the motion vectors of the image.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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